**Position title:** Internship positions: Operational Research for electrical grid architecture study

**Contract type:** Internship

**Duration:** 6 months

**Start date:** Early 2019

## SuperGrid Institute recruits Intern F/M

The Institute for Energy Transition (ITE) Supergrid is a collaborative research platform in the field of low-carbon energy, bringing together the expertise of industry and public research in the logic of public-private co-investment and close cooperation between all stakeholders of the sector.

The institute aims to develop technologies for the Supergrid that is the future electricity transmission network, using direct current and alternating current at very high voltages (in the order of one million volts), designed to transport large-scale energy from renewable sources remote from load centers, a significant portion of which are offshore, which will be in connection with flexible storage resources; to manage the intermittent nature of renewable energy; and also, to ensure the stability and security of the network.

### Program 1 general context

SuperGrid Institute program 1 carries out research and development on future power transmission systems based on a combination of AC and DC transmission technologies. More specifically, the research is focused on multi-terminals High Voltage Direct Current (HVDC) grid for off-shore or continental transmission. Program 1 comprises four sub-programs: grid architecture principles study and optimization, grid protection strategies, grid control strategies, grid simulation platform development. Application fields for our studies are mainly HVDC grids and Offshore Wind Farm grids.

### HVDC grids architecture study and optimization

Main objective is to study, analyse and optimize architecture principles for HVDC grids. The studies are carried out through two main coordinated research axis:

**What are the best architecture principles and associated new components for the development of HVDC grids?** From system functional analysis, it aims to define best architectures, as well as associated components, to answer to specific functional needs for HVDC grids. More particularly, functional specifications of new components have to be provided to others SuperGrid Institute Programs which are in charge of developing technologies for HVDC grids. Simulation works are generally carried out to support studies.

**How to assess, compare and optimize these architectures?** Objectives are to develop methods and associated tools to support the architecture principles studies. Methods and tools shall be able to propose robust optimized architectures, more particularly in regards of high uncertain environments (high penetration of renewables, energy market data, future scenarios in terms of generation portfolio and demand …) and from risk analysis point of view.

*Shaping power transmission*

## Proposed internship

More particularly, our team is developing IT tools dedicated for the modelling, optimization, simulation and technical-economic evaluation of electrical grid architectures (high voltage transmission grids, offshore wind farms grid connections). As part of this activity, we are seeking an intern whose main mission will be to:

**Design, implement, test and document operational research algorithms applied to the technical-economic analysis of electrical grids architectures in Python advanced programming environment.**

The main focus of the internship will be made on offshore wind farm grid connection systems, in particular regarding:
- Power cables routing based on heuristic optimization methods;
- Implementation of stochastic simulation methods.

Every-day development activities will involve:
- functional requirements meetings with grid architecture and systems experts;
- software design meetings with the software expert for the algorithms implementation;
- test-driven development;
- code documentation.

During the internship, the developed algorithms will be integrated into the in-house IT tools described above. You will evolve in a pleasant and dynamic working environment. This internship is an occasion for you to develop skills in the domain of energy systems and more specifically in offshore wind power and innovative transmission grids.

## Profile of the candidate

Master or engineering school student in the last year of her/his studies.

Sought competencies:
- You appreciate team work
- Knowledge of the Python programming language
- Applied mathematics
- Good command of the English language, both written and spoken
- Scientific rigor

## Other information

- Workplace: ITE SuperGrid Institute, Villeurbanne (69)
- Contact for application: leo.dalmar@supergrid-institute.com

Applications to be submitted by the end of December 2018. The application has to include the internship title, candidate name, CV and the most recent marks.